

Phys 3320 Electricity and Magnetism I
Fall 2018
Assignment 2

Don't be afraid to use Maple for some of these integrals.

1. A semi-infinite line ($-\infty \leq x \leq 0$) has a uniform line charge λ_0 . Find the electric field at the point $b\mathbf{i}$ (assume $b > 0$).
2. A semi-infinite line ($-\infty \leq x \leq 0$) has a line charge $\lambda_0 / (b-x)^n$, where $n > 1$. Find the electric field at the point $b\mathbf{i}$ (assume $b > 0$).
3. A semi-infinite line ($-\infty \leq x \leq 0$) has a line charge $\frac{\lambda_0}{\sqrt{b^2+x^2}}$. Find the electric field at the point $b\mathbf{j}$ (assume $b > 0$).
4. Repeat the previous question for an infinitely long line $-\infty \leq x \leq +\infty$.
5. A line charge $\lambda_0 (1+\sin(\varphi))$ lies on the circle of radius R lying in the x - y plane with its centre at the origin. Find the electric field at the point $\mathbf{r} = z\mathbf{k}$.
 - a. Find the total charge Q on the circle, and express your answer in terms of Q .
 - b. What is the functional form of your answer in the limit that $z \rightarrow \infty$?